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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

## Biology and Control of Lilac Borer in the Northern Great Plains

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Life stages, seasonal history, impact, and control of lilac borer, *Podosesia syringae* (Harris) (Lepidoptera: Sesiidae) in green ash, *Fraxinus pennsylvanica* Marshall, of the northern Great Plains are described. For maximum control of shelterbelt and landscape trees, insecticides should be applied 10-14 days after first emergence. A synthetic attractant can be used to monitor seasonal flight activity of male moths and trap capture data used to determine the most effective time to apply the insecticides.

Green ash (*Fraxinus pennsylvanica* Marshall), is a long-lived, winter-hardy, alkali-and drought-resistant broadleaf found both in native stands and in farm, field and urban plantings on the Great Plains. Trees are frequently infested with lilac borers<sup>3</sup>, *Podosesia syringae* (Harris) (Lepidoptera: Sesiidae), a moth whose larvae construct galleries in wood beneath the bark. In a 1972 survey of green ash in 96 North Dakota field and farmstead windbreaks, lilac borer was present in 51% of the plantings and infested 3.5% of the trees in these plantings (Tunnock and Tagestad 1973). In a 1976 survey of 116 green ash shelterbelts in North Dakota, 41% of the shelterbelts and 3.8% of the green ash were infested<sup>4</sup>.

Lilac borer may infest as much as 50% of the green ash in urban plantings (Peterson 1971). In August 1977, 33% of the boulevard green ash trees in Grand Forks were infested with lilac borers<sup>5</sup>. Lilac borer infestations have recently been reported in Pierre, S. Dak., and Bismarck and Minot, N. Dak.<sup>6 7</sup> Severe borer damage often results in wind breakage, general decline in tree vigor, decreased esthetic value, or tree mortality.

### Description of Life Stages

The adult is a day-flying, wasp-like moth with transparent hind wings, slender abdomen, and

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<sup>3</sup>This is the approved common name of the insect called ash borer in the Great Plains and the South.

<sup>4</sup>Flavel, T. H., A. D. Tagestad, S. Sladek, and M. E. Dix. A 1976 survey to evaluate wood borers in green ash windbreaks in North Dakota. USDA For. Serv. Div. State and Private For. R-1. Missoula, Montana. In preparation.

<sup>5</sup>Staley, J. 1977. City Forester. Grand Forks, N. Dak. Personal communication.

<sup>6</sup>Suedkamp, J. 1977. South Dakota Game and Fish Department, Pierre. Personal communication.

<sup>7</sup>Blackwell, G. 1977. City Forester. Bismarck, N. Dak. Personal communication.



Figure 1.—Typical lilac borer damage in green ash.



Figure 2.—Lilac borer moth [*Podosesia syringae* (Harris)].



Figure 3.—Eggs of lilac borer.



Figure 4.—Lilac borer larvae in gallery.

Figure 5.—Lilac borer pupa in larval gallery. Note emergence flap.



Figure 6.—Pupal skin left by emerging lilac borer moth.



very long yellow and black hind legs (fig. 1). Color varies from yellow to brown-black. The Bowman County form has several wide yellow bands on its abdomen while the Turtle Mountain (Bottineau County) form has several indistinct orange or reddish orange bands on the abdomen. The wings of all lilac borers are narrow and span 25 to 35 mm.

The eggs are tan, elliptical in shape, about 0.7 mm long and 0.4 mm wide (Solomon 1975, Purrington and Nielsen 1977) (fig. 2).

Newly hatched larvae are white with an amber-colored head and about 1 mm long. Mature larvae are about 26 mm long, creamy white with a shiny brown head (fig. 3).

The tan to reddish-brown pupa is 18-24 mm long with small backward projecting spines on the abdomen (Solomon 1975, Anonymous 1971) (fig. 4). Its skin remains protruding from the tree following adult emergence (fig. 5).

### Life Cycle

Lilac borer occurs from the Atlantic Ocean to the Rocky Mountains of the United States and Canada (Purrington and Nielsen 1977). All populations studied in the United States have a 1-year life cycle. Peterson (1971) reports a 2-year life cycle in Canada. In North Dakota, the moths usually emerge from May through July with a peak in June. The female emits a potent airborne scent, known as a sex pheromone, that attracts males (Nielsen and Balderston 1973). Very minute amounts of the sex attractant (Z,Z)-3, 13-octadecadien-1-ol acetate (Nielsen et al. 1975) can attract males over a distance of at least half-a-mile. After mating, the female lays eggs on the bark surface, especially in cracks and crevices of old wounds. Ten to 14 days later the larvae hatch and bore into the tree. Young larvae initially "mine" just beneath the bark and later "mine" into the sapwood. Entrances to new galleries are marked by frass—a mixture of fine boring dust, oozing sap and body wastes. Older galleries are marked by larger clumps of frass which collect at the irregular entrance hole, in bark crevices below the hole, or on the ground at the base of the tree. During the summer, larvae continue to feed and extend their tunnels first horizontally into the sapwood, then upwards until they bore to within a few millimeters of the bark late in the season. Completed tunnels are about the width of a pencil (5-7 mm) and vary from 7-32 cm in length.

Larvae overwinter in the heartwood. Prior to pupating the following spring they construct an emergence hole in the bark (fig. 4). The pupa uses the backward projecting spines to wriggle forward, break the bark, and push partially out the exit hole. When the moth emerges, the pupal skin is left in the exit (Peterson 1971, Solomon 1975) (fig. 6).

### Control

Parasites, predators, and diseases are natural enemies of lilac borer larvae and adults. During the summer the wasps *Macrocentrus marginator* (Nees) and *Apanteles* sp. locate and parasitize larvae. The fungus *Beauveria bassiana* (Bals) Vuillmon, may also occur in the galleries and kill larvae. During the winter and spring, woodpeckers destroy large numbers of larvae and pupae. Although these natural controls reduce lilac borer population, they will not control it.

Silvicultural practices which improve tree vigor may reduce borer survival or enable trees to withstand attack. These practices include cultivation to control competing vegetation, irrigation to decrease effects of drought, thinning to remove competing, diseased, and dead trees, and pruning to remove weakened, diseased, injured, or dead branches. Every effort should be made to maintain tree vigor while the trees are young and more vulnerable to lilac borer damage.

The insecticides Dursban<sup>R</sup> (0.5%)<sup>8</sup> and lindane (0.5%) are registered for control of lilac borer in green ash. Only registered commercial applicators can apply Dursban. The insecticides are mixed with water according to the directions on the label and then sprayed to runoff on the trunk and all branches below a height of 2 m. Gallery entrances, rough areas and wounds should be thoroughly sprayed. A compress air sprayer or a hydraulic sprayer may be used to apply the insecticide. Contact your county extension agent or land grant university for additional information on insecticides and their application.

The insecticides kill newly hatched larvae before they become established in trees. For

<sup>8</sup> Trade names are used for the benefit of the reader and do not imply endorsement or preferential treatment by the U.S. Department of Agriculture.

maximum effectiveness, they must be sprayed on the lower trunk and branches approximately 10-14 days after first adult emergence. In North Dakota, first emergence of adult lilac borer varies from mid-May to early June. Consequently, a borer spray should be applied during the latter part of May or the first week in June. Timing can be pinpointed by monitoring male flight activity with pheromone traps. Traps suitable for this purpose are commercially available. Contact your county extension agent or your land grant university concerning trap availability.

During May, June, and July, 1975 and 1976, emergence of lilac borer males was monitored in four multi-row shelterbelts surrounding the U.S. Army Corps of Engineers Bowman-Haley Reservoir in Bowman County, North Dakota, and in mixed hardwood stands of the Turtle Mountains in Bottineau County, North Dakota. In 1975, we baited sticky traps with rubber septa dispensers containing a synthetic attractant. In 1976, traps were baited with Conrel<sup>8</sup> hollow-fiber dispensers containing the attractant (fig. 7). The 25 traps at the Bowman-Haley

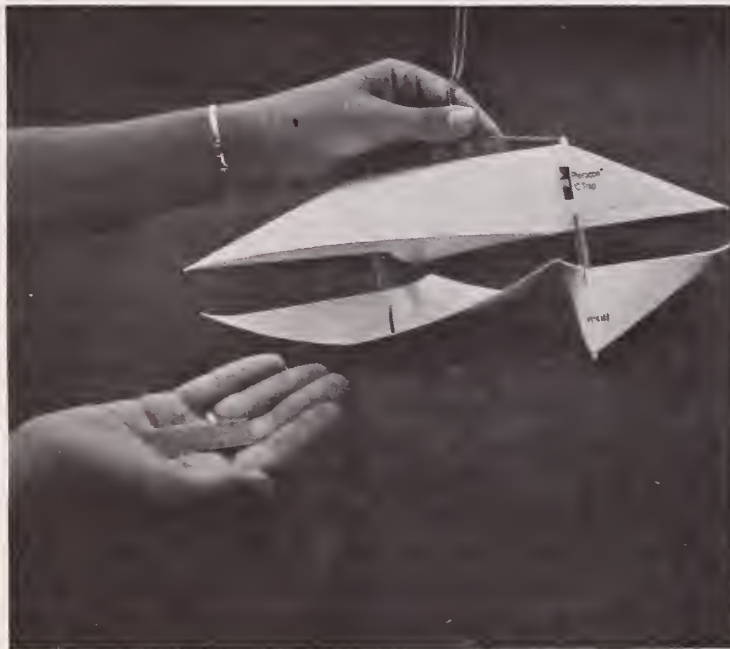


Figure 7.—Pherocon 1C trap and conrel dispenser containing (Z,Z)-3,13-octadecadien-1-ol acetate.

Reservoir and 10 traps in the Turtle Mountains were positioned on the green ash trees about 1 m above the ground. Traps were changed and trap catches recorded every 2 weeks in Bowman County and biweekly in Bottineau County.

The 1975 Bowman County flight began in mid-June and peaked at an average 18.8 males per trap prior to June 24. Emergence in Bottineau County began the third week in June and rose to an average 10 males per trap on July

3. Trap capture then dropped to an average 5.1 males per trap by July 9, because of low temperatures, but regained an average of 11 males per trap by July 15. In 1976, lilac borer emergence in Bowman and Bottineau Counties began and peaked two weeks earlier than in 1975, a circumstance which can also be attributed to warmer temperature patterns.

For maximum protection of shelterbelt and landscape green ash trees, insecticides should be applied 10-14 days after first emergence (trap capture) of male lilac borers. For example, in Bowman County, borers first emerged on May 26, 1975. Consequently, insecticides should have been applied to green ash trees between June 5 and 9. In 1976, first emergence occurred on May 11. The trees should have been sprayed between May 21 and 25.

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